

APPENDIX A DEFINITIONS

BEST TRACK - A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement, and based on an assessment of all available data.

CENTER - The vertical axis or core of a tropical cyclone. Usually determined by cloud vorticity patterns, wind and/or pressure distribution.

EPHEMERIS - Position of a body (satellite) in space as a function of time; used for gridding satellite imagery. Since ephemeris gridding is based solely on the predicted position of the satellite, it is susceptible to errors from vehicle wobble, orbital eccentricity, the oblateness of the Earth, and variation in vehicle speed.

EXPLOSIVE DEEPENING - A decrease in the minimum sea-level pressure of a tropical cyclone of 2.5 mb/hr for at least 12 hours or 5.0 mb/hr for at least six hours (Dunnavan, 1981).

EXTRATROPICAL - A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy source from the release of latent heat of condensation to baroclinic processes. It is important to note that cyclones can become extratropical and still maintain winds of typhoon or storm force.

EYE - The central area of a tropical cyclone when it is more than half surrounded by wall cloud.

FUJIWHARA EFFECT - A binary interaction where tropical cyclones within about 750 nm (1390 km) of each other begin to rotate about a

common midpoint (Brand, 1970; Dong and Neumann, 1983).

INTENSITY - The maximum sustained 1-minute mean surface wind speed, typically within one degree of the center of a tropical cyclone.

MAXIMUM SUSTAINED WIND - The highest surface wind speed averaged over a 1-minute period of time. (Peak gusts over water average 20 to 25 percent higher than sustained winds.)

MONSOON GYRE - A mode of the monsoon circulation characterized by:

- 1) a large (diameter on the order of 1000 nm (2000 km)) nearly circular low-level cyclonic vortex; 2) nearly circular isobars with the outermost closed isobar possessing a diameter of roughly 1000 nm (2000 km); 3) a northward displacement of the sea-level pressure minimum with respect to the latitude of the pressure minimum found along any meridian passing through the long-term monthly mean monsoon trough; and 4) lower than average sea-level pressure throughout most of the tropical western North Pacific (Lander, 1992).

NORTHWARD-DISPLACED, SELF-SUSTAINING, SOLITARY (NSS) MONSOON GYRE - A specific type of monsoon gyre in the western North Pacific with some particular characteristics:

- 1) a relatively long (three-week) lifespan; 2) a slow westward migration; 3) a cloud band rimming the southern through eastern periphery of the low-level vortex/surface low; 4) for at least the first half of its lifespan — a subsident regime in its core with light winds and scattered cumulus cloud of little vertical development; and 5) the large circular vortex cannot be the

result of the expanding wind field of a large typhoon (Lander, 1992).

RAPID DEEPENING - A decrease in the minimum sea-level pressure of a tropical cyclone of 1.75 mb/hr or 42 mb for 24-hours (Holliday and Thompson, 1979).

RECURVATURE - The turning of a tropical cyclone from an initial path toward the west and poleward to east and poleward, after moving poleward of the mid-tropospheric subtropical ridge axis.

SIGNIFICANT TROPICAL CYCLONE - A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SIZE - The areal extent of a tropical cyclone, usually measured radially outward from the center to the outer-most closed isobar.

STRENGTH - The average wind speed of the surrounding low-level wind flow, usually measured within one to three degrees of the center of a tropical cyclone (Weatherford and Gray, 1985).

SUBTROPICAL CYCLONE - A low pressure system that forms over the ocean in the subtropics and has some characteristics of a tropical circulation, but not a central dense overcast. Although of upper cold low or low-level baroclinic origins, the system can transition to a tropical cyclone.

SUPER TYPHOON - A typhoon with maximum sustained 1-minute mean surface winds of 130 kt (67 m/sec) or greater.

TROPICAL CYCLONE - A non-frontal, migratory low-pressure system, usually of synoptic scale, originating over tropical or subtropical waters and having a definite

organized circulation.

TROPICAL DEPRESSION - A tropical cyclone with maximum sustained 1-minute mean surface winds of 33 kt (17 m/sec) or less.

TROPICAL DISTURBANCE - A discrete system of apparently organized convection, generally 100 to 300 nm (185 to 555 km) in diameter, originating in the tropics or subtropics, having a non-frontal, migratory character and having maintained its identity for 12- to 24-hours. It may or may not be associated with a detectable perturbation of the low-level wind or pressure field. It is the basic generic designation which, in successive stages of development, may be classified as a tropical depression, tropical storm, typhoon or super typhoon.

TROPICAL STORM - A tropical cyclone with maximum 1-minute mean sustained surface winds in the range of 34 to 63 kt (17 to 32 m/sec), inclusive.

TROPICAL UPPER-TROPOSPHERIC TROUGH (TUTT) - A dominant climatological system and a daily upper-level synoptic feature of the summer season, over the tropical North Atlantic, North Pacific and South Pacific Oceans (Sadler, 1979).

TYPHOON (HURRICANE) - A tropical cyclone with maximum sustained 1-minute mean surface winds of 64 to 129 kt (33 to 66 m/sec). West of 180 degrees east longitude they are called typhoons and east of 180 degrees east longitude hurricanes.

WALL CLOUD - An organized band of deep cumuliform clouds that immediately surrounds the central area of a tropical cyclone. The wall cloud may entirely enclose or partially surround the center.

APPENDIX B

NAMES FOR TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND SOUTH CHINA SEA

Column 1		Column 2		Column 3		Column 4	
ANGELA	<i>AN-gel-ah</i>	ABE	<i>ABE</i>	AMY	<i>A-mee</i>	AXEL	<i>AX-ell</i>
BRIAN	<i>BRY-an</i>	BECKY	<i>BECK-ee</i>	BRENDAN	<i>BREN-dan</i>	BOBBIE	<i>BOB-ee</i>
COLLEEN	<i>COL-leen</i>	CECIL	<i>CEE-cil</i>	CAITLIN	<i>KATE-lin</i>	CHUCK	<i>CHUCK</i>
DAN	<i>DAN</i>	DOT	<i>DOT</i>	DOUG	<i>DUG</i>	DEANNA	<i>dee-AN-na</i>
ELSIE	<i>ELL-see</i>	ED	<i>ED</i>	ELLIE	<i>ELL-ee</i>	ELI	<i>EE-lye</i>
FORREST	<i>FOR-rest</i>	FLO	<i>FLO</i>	FRED	<i>FRED</i>	FAYE	<i>FAY</i>
GAY	<i>GAY</i>	GENE	<i>GEEN</i>	GLADYS	<i>GLAD-iss</i>	GARY	<i>GAR-ee</i>
HUNT	<i>HUNT</i>	HATTIE	<i>HAT-ee</i>	HARRY	<i>HAR-ee</i>	HELEN	<i>HELL-en</i>
IRMA	<i>IR-ma</i>	IRA	<i>EYE-ra</i>	IVY	<i>EYE-vee</i>	IRVING	<i>ER-ving</i>
JACK	<i>JACK</i>	JEANA	<i>JEAN-ah</i>	JOEL	<i>JOLE</i>	JANIS	<i>JAN-iss</i>
KORYN	<i>ko-RIN</i>	KYLE	<i>KYE-ell</i>	KINNA	<i>KIN-na</i>	KENT	<i>KENT</i>
LEWIS	<i>LOU-iss</i>	LOLA	<i>LOW-lah</i>	LUKE	<i>LUKE</i>	LOIS	<i>LOW-iss</i>
MARIAN	<i>MAH-rian</i>	MANNY*	<i>MAN-ee</i>	MELISSA*	<i>meh-LISS-ah</i>	MARK	<i>MARK</i>
NATHAN	<i>NAY-than</i>	NELL	<i>NELL</i>	NAT	<i>NAT</i>	NINA	<i>NEE-nah</i>
OFELIA	<i>oh-FEEL-ya</i>	OWEN	<i>OH-en</i>	ORCHID	<i>OR-kid</i>	OMAR	<i>OH-mar</i>
PERCY	<i>PURR-see</i>	PAGE	<i>PAGE</i>	PAT	<i>PAT</i>	POLLY	<i>PA-lee</i>
ROBYN	<i>ROB-in</i>	RUSS	<i>RUSS</i>	RUTH	<i>RUTH</i>	RYAN	<i>RYE-an</i>
STEVE	<i>STEEV</i>	SHARON	<i>SHAR-on</i>	SETH	<i>SETH</i>	SIBYL	<i>SIB-ill</i>
TASHA	<i>TA-sha</i>	TIM	<i>TIM</i>	TERESA*	<i>teh-REE-sah</i>	TED	<i>TED</i>
VERNON	<i>VER-non</i>	VANESSA	<i>vah-NES-ah</i>	VERNE	<i>VERN</i>	VAL	<i>VAL</i>
WINONA	<i>wi-NO-nah</i>	WALT	<i>WALT</i>	WILDA	<i>WILL-dah</i>	WARD	<i>WARD</i>
YANCY	<i>YAN-see</i>	YUNYA	<i>YUNE-yah</i>	YURI	<i>YOUR-ee</i>	YVETTE	<i>ee-VET</i>
ZOLA	<i>ZO-lah</i>	ZEKE	<i>ZEEK</i>	ZELDA	<i>ZELL-dah</i>	ZACK	<i>ZACK</i>

* Name changes: MANNY replaced MIKE in 1991; MELISSA replaced MIREILLE, and TERESA replaced THELMA in 1992.

NOTE 1: Names are assigned in rotation and alphabetically. When the last name in Column 4 (ZACK) has been used, the sequence will begin again with the first name in Column 1 (ANGELA).

NOTE 2: Pronunciation guide for names are italicized.

SOURCE: CINCPACINST 3140.1U

APPENDIX C CONTRACTIONS

A-track	Along-track	AWDS	Automated Weather Distribution System	DMSP	Defense Meteorological Satellite Program
AB	Air Base				
ABW	Air Base Wing	AWN	Automated Weather Network	DOD	Department of Defense
ABIO	Significant Tropical Weather Advisory for the Indian Ocean	CCWF	Combined Confidence Weighted Forecast	DSN	Defense Switched Network
		CDO	Central Dense Overcast	DTG	Date Time Group
ABPW	Significant Tropical Weather Advisory for the Western Pacific Ocean	CI	Current Intensity	FBAM	FNOC Beta Advection Model
		CINCPAC	Commander-in-Chief Pacific (AF - Air Force, FLT - Fleet)	FI	Forecast Intensity (Dvorak)
ACFT	Aircraft				
ADP	Automated Data Processing	CIV	Civilian	FNOC	Fleet Numerical Oceanography Center
		CLD	Cloud		
AFB	Air Force Base	CLIM	Climatology	FT	Feet
				GMT	Greenwich Mean Time
AFGWC	Air Force Global Weather Central	CLIP or CLIPER	Climatology and Persistence Technique	GOES	Geostationary Operational Environmental Satellite
AFTN	Airfield Fixed Telecommunication Network	CM	Centimeter(s)		
		CNOC	Commander Naval Oceanography Command	GTE/PEM-West	Global Tropospheric Experiment/Pacific Exploratory Measurements - West
AIREP	Aircraft (Weather) Report				
AMOS	Automatic Meteorological Observing Station	CPA	Closest Point of Approach	GTS	Global Telecommunications System
		CPHC	Central Pacific Hurricane Center	HPAC	Mean of XTRP and CLIM Techniques (Half Persistence and Climatology)
AOR	Area of Responsibility				
APT	Automatic Picture Transmission	CSC	Cloud System Center		
		CSUM	Colorado State University Model	HR	Hour(s)
ARGOS	International Service for Drifting Buoys			HRPT	High Resolution Picture Transmission
		DDN	Defense Data Network		
ATCF	Automated Tropical Cyclone Forecast (System)	DEG	Degree(s)	ICAO	International Civil Aviation Organization
		Det	Detachment		
AUTODIN	Automated Digital Network	DFS	Digital Facsimile System	INIT	Initial

INST	Instruction	NASA	National Aeronautics and Space Administration	NRL	Naval Research Laboratory
IR	Infrared			NRPS or NORAPS	Navy Operational Regional Atmospheric Prediction System
JTWC	Joint Typhoon Warning Center	NEDN	Naval Environmental Data Network		
KM	Kilometer(s)	NEDS	Naval Environmental Display Station	NSDS	Naval Satellite Display System
KT	Knot(s)	NEPRF	Naval Environmental Prediction Research Facility	NSDS-G	Naval Satellite Display System - Geostationary
LAN	Local Area Network				
LAT	Latitude	NESDIS	National Environmental Satellite, Data, and Information Service	NSS	Northward-displaced, Self-sustained, Solitary (monsoon gyre)
LLCC	Low-Level Circulation Center				
LONG	Longitude	NESN	Naval Environmental Satellite Network	NTCC	Naval Telecommunications Center
LUT	Local User Terminal	NEXRAD	Next Generation Weather (Doppler) Radar	NWOC	Naval Western Oceanography Center
LVL	Level				
M	Meter(s)	NHC	National Hurricane Center	NWS	National Weather Service
MAX	Maximum				
MB	Millibar(s)	NM	Nautical Mile(s)	OBS	Observations
MCAS	Marine Corps Air Station	NMC	National Meteorological Center	OLS	Operational Linescan System
MET	Meteorological	NOAA	National Oceanic and Atmospheric Administration	ONR	Office of Naval Research
MIDDAS	Meteorological Imagery, Data Display, and Analysis System	NOCC	Naval Oceanography Command Center	OSS	Operations Support Squadron
MIN	Minimum	NODDES	Naval Environmental Data Network	OTCM	One-Way (Interactive) Tropical Cyclone Model
MM	Millimeter(s)		Oceanographic Data Distribution and Expansion System	PACAF PACDIGS	Pacific Air Force Pacific Digital Information Graphics System
MOVG	Moving				
MSLP	Minimum Sea-level Pressure	NODDS	Navy/NOAA Oceanographic Data Distribution System	PACMEDS	Pacific Meteorological Data System
NARDAC	Naval Regional Data Automation Center	NOGAPS	Navy Operational Global Atmospheric Prediction System	PACOM	Pacific Command
NAS	Naval Air Station			PCN	Position Code Number
		NR	Number		

PDN	Public Data Network	STY	Super Typhoon	TYMNET	Time-Sharing Network: Commercial wide area network connecting micro- and main-frame computers
PIREP	Pilot Weather Report(s)	TAPT	Typhoon Acceleration Prediction Technique		
RADOB	Radar Observation	TC	Tropical Cyclone		
RECON	Reconnaissance	TCFA	Tropical Cyclone Formation Alert	ULCC	Upper-Level Circulation Center
RRDB	Reference Roster Data Base	TCM-90	Tropical Cyclone Motion Field Experiment - 1990	US	United States
RSDB	Raw Satellite Data Base			USAF	United States Air Force
SAT	Satellite	TD	Tropical Depression	USN	United States Navy
SEC	Second	TDA	Typhoon Duty Assistant	VIS	Visual
SDHS	Satellite Data Handling System	TDO	Typhoon Duty Officer	WESTPAC	Western (North) Pacific
SFC	Surface	TIROS	Television Infrared Observational Satellite	WMO	World Meteorological Organization
SGDB	Satellite Global Data Base	TOGA	Tropical Ocean Global Atmosphere	WRN or WRNG	Warning(s)
SLP	Sea-Level Pressure	TOVS	TIROS Operational Vertical Sounder	WS	Weather Squadron
SSM/I	Special Sensor Microwave/Imager	TS	Tropical Storm	X-track	Cross-track
SST	Sea Surface Temperature	TUTT	Tropical Upper- Tropospheric Trough	XTRP	Extrapolation
STNRY	Stationary	TY	Typhoon	Z	Zulu time (Greenwich Mean Time/Universal Coordinated Time)
ST	Subtropical	TYAN	Typhoon Analog (Program)		
STR	Subtropical Ridge				

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17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	TROPICAL CYCLONES TROPICAL STORMS		
04	02		TROPICAL DEPRESSIONS TYPHOONS/SUPER TYPHOONS		
			TROPICAL CYCLONE RESEARCH METEOROLOGICAL SATELLITES		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) ANNUAL PUBLICATION SUMMARIZING TROPICAL CYCLONE ACTIVITY IN THE WESTERN NORTH PACIFIC, BAY OF BENGAL, ARABIAN SEA, WESTERN SOUTH PACIFIC AND SOUTH INDIAN OCEANS. A BEST TRACK IS PROVIDED FOR EACH SIGNIFICANT TROPICAL CYCLONE. A BRIEF NARRATIVE IS GIVEN FOR ALL TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC AND NORTH INDIAN OCEANS. ALL FIX DATA USED TO CONSTRUCT THE BEST TRACKS ARE PROVIDED, UPON REQUEST, ON DISKETTES. FORECAST VERIFICATION DATA AND STATISTICS FOR THE JOINT TYPHOON WARNING CENTER (JTWC) ARE SUBMITTED.					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
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BLOCK 18 CONTINUED

RADAR
AUTOMATIC METEOROLOGICAL OBSERVING STATIONS
SYNOPTIC DATA
TROPICAL CYCLONE INTENSITY
TROPICAL CYCLONE BEST TRACK DATA
TROPICAL CYCLONE FORECASTING
TROPICAL CYCLONE RECONNAISSANCE
TROPICAL CYCLONE STEERING MODELS
OBJECTIVE FORECASTING TECHNIQUES
TROPICAL CYCLONE FIX DATA
MICROWAVE IMAGERY
DRIFTING BUOYS

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